



General

Guideline Title

Evaluation and management of penetrating lower extremity arterial trauma: an Eastern Association for the Surgery of Trauma practice management guideline.

Bibliographic Source(s)

Fox N, Rajani RR, Bokhari F, Chiu WC, Kerwin A, Seamon MJ, Skarupa D, Frykberg E, Eastern Association for the Surgery of Trauma. Evaluation and management of penetrating lower extremity arterial trauma: an Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg. 2012 Nov;73(5 Suppl 4):S315-20. [24 references] [PubMed](#)

Guideline Status

This is the current release of the guideline.

This guideline updates a previous version: EAST Practice Management Guidelines Work Group. Practice management guidelines for the management of penetrating trauma to the lower extremity. Winston-Salem (NC): Eastern Association for the Surgery of Trauma (EAST); 1999. 35 p. [74 references]

Recommendations

Major Recommendations

The levels of recommendation (1-3) and classification of evidence (I-III) are defined at the end of the "Major Recommendations" field.

Note: It is important to note that the 2002 guidelines were reviewed for content and validity and remain relevant as previously written. They are identified in Section/Level 3 as the recommendations followed by "(2002)."

Level 1

1. Computed tomographic angiography (CTA) may be used as the primary diagnostic study for evaluation of penetrating lower extremity vascular injury when imaging is required.

Level 2

1. Patients with hard signs of arterial injury (pulse deficit, pulsatile bleeding, bruit, thrill, expanding hematoma) should be surgically explored. There is no need for arteriogram in this setting unless the patient has an associated skeletal or shotgun injury. Restoration of perfusion to an extremity with an arterial injury should be performed in less than 6 hours to maximize limb salvage (2002).
2. Patients (without hard signs of vascular injury) who have abnormal physical examination findings and/or an ankle-brachial index (ABI) <0.9

should have further evaluation to rule out vascular injury.

3. Patients with normal physical examination findings and an ABI >0.9 may be discharged (in the absence of other injuries requiring admission).

Level 3

1. In cases of hemorrhage from penetrating lower extremity trauma in which manual compression is unsuccessful, tourniquets may be used as a temporary adjunct for hemorrhage control until definitive repair.
2. The use of temporary intravascular shunts (TIVSs) may be indicated to restore arterial flow in combined vascular/orthopedic injuries (Gustillo IIIC fractures) to facilitate limb perfusion during orthopedic stabilization.
3. TIVSs may be indicated in "damage control" situations to facilitate limb perfusion when the physiologic status of the patient or operative capabilities prevent definitive repair.
4. There are no data to support the routine use of endovascular therapies following infrainguinal trauma.
5. Embolization of profunda branches or tibial vessels is acceptable, and there are no data to support preferential use of coils or n-butyl-2-cyanoacrylate (NCBA) glue.
6. The role of noninvasive Doppler pressure monitoring or duplex ultrasonography to confirm or exclude arterial injury is not well defined. There may be a role for these studies in patients with soft signs of vascular injury or with proximity injuries (2002).
7. Nonoperative observation of asymptomatic nonocclusive arterial injuries is acceptable (2002).
8. Repair of occult and asymptomatic nonocclusive arterial injuries managed nonoperatively that subsequently require repair can be done without significant increase in morbidity (2002).
9. Simple arterial repairs fare better than grafts. If complex repair is required, vein grafts seem to be the best choice. Polytetrafluoroethylene (PTFE), however, is also an acceptable conduit (2002).
10. PTFE may be used in a contaminated field. Effort should be made to obtain soft tissue coverage (2002).
11. Tibial vessels may be ligated if there is documented flow distally (2002).
12. Early four-compartment lower leg fasciotomy should be applied liberally when there is an associated injury or there has been prolonged ischemia. If not performed, compartment pressures should be closely monitored (2002).
13. Arteriography for proximity is indicated only in patients with shotgun injuries (2002).
14. Completion arteriogram should be performed after arterial repair (2002).

Definitions:

Classes of Evidence

Class I: Prospective randomized clinical trials.

Class II: Clinical studies in which data were collected prospectively or retrospective analyses based on clearly reliable data.

Class III: Studies based on retrospectively collected data.

Note: Several of the references identified as relevant to this update were investigating a diagnostic test. These were classified based on the *Journal of Trauma* guidelines on level of evidence for diagnostic studies (those investigating a diagnostic test):

Level I: Testing of previously developed diagnostic criteria in a series of consecutive patients (with universally applied reference "gold" standard) or systematic review of Level I studies.

Level II: Development of diagnostic criteria on the basis of consecutive patients (with universally applied reference gold standard) or systematic review of Level II studies.

Level III: Study of nonconsecutive patients (without consistently applied reference gold standard) or systematic review of Level III studies.

Levels of Recommendations

Level 1: The recommendation is convincingly justifiable based on the available scientific information alone. This recommendation is usually based on Class I data; however, strong Class II evidence may form the basis for a Level 1 recommendation, especially if the issue does not lend itself to testing in a randomized format. Conversely, low quality or contradictory Class I data may not be able to support a Level 1 recommendation.

Level 2: The recommendation is reasonably justifiable by available scientific evidence and strongly supported by expert opinion. This recommendation is usually supported by Class II data or a preponderance of Class III evidence.

Level 3: The recommendation is supported by available data, but adequate scientific evidence is lacking. This recommendation is generally supported by Class III data. This type of recommendation is useful for educational purposes and in guiding future clinical research.

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Penetrating lower extremity arterial trauma

Guideline Category

Diagnosis

Evaluation

Management

Treatment

Clinical Specialty

Emergency Medicine

Orthopedic Surgery

Radiology

Surgery

Intended Users

Advanced Practice Nurses

Allied Health Personnel

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To develop updated guidelines of how to diagnose, treat, and manage penetrating lower extremity arterial trauma
- To revise and expand on the 2002 Eastern Association for the Surgery of Trauma (EAST) recommendations

Target Population

Patients with penetrating trauma to the lower extremities

Interventions and Practices Considered

Evaluation/Diagnosis

1. Physical examination
 - Hard signs of arterial injury (pulse deficit, pulsatile bleeding, bruit, thrill, expanding hematoma)
 - Ankle-brachial index (ABI) measurement
2. Computed tomographic angiography (CTA)
3. Further evaluation to rule out vascular injury

Treatment/Management

1. Surgery, including restoration of perfusion to an extremity
2. Tourniquets
3. Temporary intravascular shunts (TIVSs)
4. Endovascular intervention (embolization)

Major Outcomes Considered

- Signs and symptoms of penetrating lower extremity arterial trauma
- Sensitivity and specificity of imaging tests
- Treatment effectiveness

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

A search of the National Library of Medicine and the National Institutes of Health MEDLINE database was performed using the [PubMed Web site](#) , with citations published between the years 1998 and 2011. Search terms included "vascular trauma," "arterial injury," "extremity trauma," "penetrating trauma," and "vascular injury." Articles were limited to those in the English language involving human subjects. Letters to the editor, case reports, book chapters, and review articles were excluded.

Number of Source Documents

20 articles were selected to construct the guidelines.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Class I: Prospective randomized clinical trials.

Class II: Clinical studies in which data were collected prospectively or retrospective analyses based on clearly reliable data.

Class III: Studies based on retrospectively collected data.

Note: Several of the references identified as relevant to this update were investigating a diagnostic test. These were classified based on the *Journal*

of *Trauma* guidelines on level of evidence for diagnostic studies (those investigating a diagnostic test):

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Level III: Study of nonconsecutive patients (without consistently applied reference gold standard) or systematic review of Level III studies.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

These articles were reviewed by the committee chair for relevance, and the final reference list of 43 citations was distributed to the remainder of the study group for review. Of these, 20 articles were felt to be useful for construction of these guidelines, and an evidentiary table was constructed.

Articles were classified as Class I, II, or III as described in the Eastern Association for the Surgery of Trauma (EAST) "Utilizing evidence based outcome measures to develop practice management guidelines: a primer" (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Recommendations were classified as level 1, 2, or 3 according to the definitions listed in the "Rating Scheme for the Strength of the Recommendations" field.

Rating Scheme for the Strength of the Recommendations

Level 1: The recommendation is convincingly justifiable based on the available scientific information alone. This recommendation is usually based on Class I data; however, strong Class II evidence may form the basis for a Level 1 recommendation, especially if the issue does not lend itself to testing in a randomized format. Conversely, low quality or contradictory Class I data may not be able to support a Level 1 recommendation.

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Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Not stated

Description of Method of Guideline Validation

Not applicable

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Appropriate diagnosis, treatment and management of patients with lower extremity arterial injury after penetrating trauma

Potential Harms

- Most of the complications of patients being discharged with a lower extremity wound and an ankle-brachial index >0.9 involved soft tissue infection. Only one patient had a delayed presentation of compartment syndrome, which manifested 2 days after discharge.
- The complication rate for tourniquet use is exceedingly low and limited to transient nerve palsy. The authors recommended that ischemic time be kept as short as possible and that tourniquets be replaced with bandages when appropriate.

Qualifying Statements

Qualifying Statements

- Further investigation into endovascular interventions for penetrating lower extremity trauma is warranted. The data reviewed for this practice management guideline on endovascular management were limited. Although well established in the elective setting, it is not clear what role endovascular treatment will ultimately have in the treatment of traumatic arterial injuries.
- The Eastern Association for the Surgery of Trauma (EAST) is a multi-disciplinary professional society committed to improving the care of injured patients. The Ad hoc Committee for Practice Management Guideline Development of EAST develops and disseminates evidence-based information to increase the scientific knowledge needed to enhance patient and clinical decision-making, improve health care quality, and promote efficiency in the organization of public and private systems of health care delivery. Unless specifically stated otherwise, the opinions expressed and statements made in this publication reflect the authors' personal observations and do not imply endorsement by nor official policy of the Eastern Association for the Surgery of Trauma.
- "Clinical practice guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances."^{*} These guidelines are not fixed protocols that must be followed, but are intended for health care professionals and providers to consider. While they identify and describe generally recommended courses of intervention, they are not presented as a substitute for the advice of a physician or other knowledgeable health care professional or provider. Individual patients may require different treatments from those specified in a given guideline. Guidelines are not entirely inclusive or exclusive of all methods of reasonable care that can obtain/produce the same results. While guidelines can be written that take into account variations in clinical settings, resources, or common patient characteristics, they cannot address the unique needs of each patient nor the combination of resources available to a particular community or health care professional or provider. Deviations from clinical practice guidelines may be justified by individual circumstances. Thus, guidelines must be applied based on individual patient needs using professional judgment.

^{*}Institute of Medicine. Clinical practice guidelines: directions for a new program. MJ Field and KN Lohr (eds) Washington, DC: National Academy Press. 1990: pg 39.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

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Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

1999 (revised 2012 Nov)

Guideline Developer(s)

Eastern Association for the Surgery of Trauma - Professional Association

Source(s) of Funding

Eastern Association for the Surgery of Trauma (EAST)

Guideline Committee

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

The authors declare no conflicts of interest.

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Guideline Availability

Electronic copies: Available from the [Eastern Association for the Surgery of Trauma Web site](#) .

Print copies: Available from the EAST Guidelines, c/o Nicole Fox, MD, MPH, Department of Surgery, Cooper University Hospital, 3 Cooper Plaza, Ste. 411, Camden, NJ 08103; email: fox-nicole@cooperhealth.edu.

Availability of Companion Documents

The following is available:

- Utilizing evidence based outcome measures to develop practice management guidelines: a primer. 2000. 18 p. Available in Portable Document Format (PDF) from the [Eastern Association for the Surgery of Trauma \(EAST\) Web site](#) .

Patient Resources

None available

NGC Status

This summary was completed by ECRI on September 17, 2001. The information was verified by the guideline developer on September 27, 2001. This NGC summary was updated by ECRI Institute on May 8, 2013.

Copyright Statement

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Readers with questions regarding guideline content are directed to contact the guideline developer.